



EUROPEAN COMMISSION
RESEARCH DIRECTORATE GENERAL

Directorate D – European Research Area: Human Factor
Research Training Networks

Brussels, 28th October 2003
D* 518103
ResDG-D-3/RM/HP152/MTR

Professor Subir Sarkar
University of Oxford
Theoretical Physics
1 Keble Road
Oxford OX1 3NP
United Kingdom

Subject: Mid-Term Review of IHP Network Contract “The Early Universe” HPRN-CT-2000-00152

Dear Professor Sarkar,

Firstly, may I thank you, and the other members of the “The Early Universe” network, for your very kind hospitality during the mid-term review meeting of 27th-28th September 2002. I would also like to offer my sincere apologies for not having replied sooner with the formal written outcome.

I enjoyed very much the meeting, which was well organised and informative, and appreciated the opportunity it gave me to meet you and the other members of the network. I appreciated also the chance to improve my understanding of the research undertaken and of how the “The Early Universe” network is organised in practice. The presentations by the team leaders and some of the networks’ young researchers were essential for these latter aspects and succeeded, in the relatively short time available, in providing me with, at least, a flavour of the networks’ research activities.

I am pleased to inform you of a successful conclusion to the networks’ mid-term review procedure. In my opinion, and that of the expert Professor Antonio Masiero, the network is working in an excellent manner providing a stimulating environment for young researchers in a challenging and topical area of astrophysics. The detailed report (attached) from Professor Masiero is glowing in its praise for the network and highlights that there are very few weaknesses in the scientific and training activities undertaken by the network.

It is evident that the inherent interdisciplinary nature of the network's research project and the mixture of small and large teams present the main challenges. Clearly, further such networks in the field may be necessary to tackle this issue and I would like to highlight that inter- and multi-disciplinary projects are one of the main focal points of the Marie Curie RTN activity in the Sixth Framework Programme.

From a more administrative point of view, I would like to express our appreciation for the high level of organisation displayed by the network, for which your efforts as co-ordinator are much appreciated. There are just a few specific points that we would like to bring to the network's attention:

- Please do not forget to acknowledge the financial support provided by the Commission in the networks' publications, where appropriate;
- To ensure that all teams in the network provide sufficient and timely support to the co-ordinator when it comes to annual reporting, compilation of cost statements, etc;
- Ensure that the networks' funds are used in the most optimal way and that the ability to transfer funds between teams is used (taking note of the 20% rule in the contract);

As discussed at the meeting, the network was around four months behind the planned schedule due to delays in recruitment. The possibility of requesting a zero-additional cost extension to the duration of the contract was discussed and, should the network wish to proceed with such a request, the following information is required:

1. A letter from the network co-ordinator formally requesting an extension, at least three months before the official end date of the contract. The letter must also provide the following:
 - a) The required duration of the extension, either 6 or 12 months.
 - b) The justification for the extension (including, among others, information on the amount of person-months that can be provided with and without the proposed extension, additional training and network events, etc).
 - c) Confirmation that this is in agreement with all the other network partners and their administrations (see below).

2. In addition, the Scientist-in-Charge and authorised Administrative official from each participant must provide a letter stating their agreement to the extension.

Upon receipt of the required documents, the procedure for amendment is undertaken, and, if approved, typically takes two to three months. I would therefore encourage you to start requesting the necessary documentation from the network partners as soon as possible.

Please do not hesitate to contact my colleague, Dr. Stephen Davies (Stephen.Davies@cec.eu.int), should you have any queries regarding the implementation of the network contract. He will be temporarily responsible for this contract until a new colleague is expected to arrive in the New Year. I would like to conclude this letter by wishing you and the other members of the network continued success.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'Raymond Monk', written over a horizontal line.

Raymond MONK

Project Officer – Physics Networks

Cc: Contract file
B. Schmitz (Head of Unit)
Scientific follow-up

**IHP Research Training Network Mid-term Review
Expert's Assessment Report**

Network short title: The Early Universe

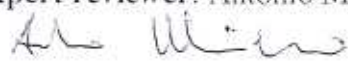
Contract n. : HPRN-CT-2000-00152

Date and place of

Mid-Term Review Meeting.: 26 September 2002, Oxford (UK)

Date of this report: 7 January 2003

Name of expert reviewer: Antonio Masiero

Signature: 

RTD ADONIS ARRIVES	DATE: 17/1/2003
	N°: 102853

Research Objectives.

All the six classes of objectives which were pointed out in the contract have received a vast and thorough attention and in all the six areas we find some works with authors belonging to different nodes of the Network. Obviously, given the large variety of different topics which are collected in the six main objectives of the Network, some subjects have been developed more extensively with more emphasis on the synergic aspects of the Network (for instance, the topics of "Inflation" and "String/M-theory cosmology"), while other objectives were addressed by a smaller number of participants, but, once again, with significant results.

Not only are the objectives described in the Contract still relevant and realistic, but I would say that, in the two years elapsed since the start of the project, at least some of them have acquired even more relevance or have developed towards further directions which were difficult to anticipate. The Network has successfully followed such fast evolution typical of astroparticle physics. The best example of such welcome flexibility of the Network to adapt its programme to the rapid evolution of the field is provided by the subject "String/M-theory cosmology" to which the Network has devoted a much more intense effort than anticipated in the Contract. In this respect, given the fast-growing nature of astroparticle research and the large spectrum of topics of the Network, I think that it is remarkable that the participants succeeded to find a correct balance between the development of research topics typically belonging to their background and the courage to open their horizon to new research projects which were recently proposed in the literature.

Methodological approach, work plan and schedule

The main methodological challenge which was nicely described and analysed in the Contract is intrinsic of a Network which intends to operate at the border between particle physics on one side and astrophysics and cosmology on the other side, namely the task of synergistically putting together the expertise of single researchers and, even more important, teams of researchers with an expertise on either research field. In my view the Network has been successful in such challenge, obviously even taking into account the unavoidable difficulties one is sure to encounter in this field. My opinion on this delicate and crucial point for the activity of the Network originates from an analysis of the publications (in particular of the joint publications) and of the presentations at the Mid-term meeting: It is clear that, as stated in the Contract, the coordinator and the steering committee of the persons in charge of the nodes have made a special effort in coping with this point (for instance in the organization of meetings, school, exchange of postdocs, etc.) and, indeed, the result looks promising.

Both in the text of the Contract and during the coordinator's presentation at the Mid-term meeting, it was emphasized that in general for a theoretical physics project, and even more, for an astroparticle one, it is practically impossible to present a definite work plan with a detailed schedule. This is obvious taking into account that one is operating at the frontier of the present knowledge and new ideas and breakthroughs can occur at any moment imposing changes in the

specific objectives and, consequently, on the schedule to achieve them. With this caveat in mind, I would say that, anyway, the network has met some concrete milestones which were defined in the Contract and it seems that the general schedule defined there is going to be successfully followed.

Research effort of the participants

As it was already mentioned above, considering the number and quality of the joint publications ((more than fifty with a good scientific impact), the publications by Young Researchers of the Network, the reports presented at the Mid-term meeting and also the general impact of the activity of the network at international conferences and workshops (where, in some cases, I was also personally present), I think that a very positive overall image of the synergism of the valuable participants of the Network clearly emerges. Once again, let me underline that this positive judgement does not come from the sum of brilliant works of particle physicists on one side and cosmologists on the other side, but, rather, from the successful attempt (at least in most cases) to merge together these two components of excellent expertise to give rise to works which can be properly defined of astroparticle physics.

The different teams have shown to be able to co-operate rather efficiently. Indeed, as pointed out by the coordinator, given the different size and strength of the team, an intense effort has been devoted to integrate all the teams, in particular concerning the case of smaller teams based in Less Favoured Regions and Associate States. According to the results described above and taking into account some specific actions which were taken for the Warsaw node (organization of PLANCK-02 in Poland) and for the Greek node (organization in Greece of the annual network school in 2004), I would say that the results are positive. Nonetheless, an even more decisive step to favour the integration and co-operation among the different nodes is recommended. Some larger teams may have the tendency to enhance the opportunities to work inside the team itself without the needed attention to involve in their research the activities of more isolated teams. The Network is aware of such risks and convenient measures have already been taken (see below, when discussing the aspects of training, in particular).

Network organization and management

The Network exhibits a good organizational level with tasks adequately distributed between the different teams. In such distribution the characterizing features of the different teams seem to have been conveniently considered. A good part of this organizational success of the Network can be traced to the work of the coordinator. He has shown both organizational and scientific competence in leading the Network so far. As I previously said, a major difficulty in organizing a Network in astroparticle physics is that one has to cope with different realities ranging from the environment typical of particle physics to the one of astrophysics and cosmology. Fortunately, the coordinator is a cosmologist with a vast and thorough experience of interaction with particle physicists and this has clearly shown up in his achievements of harmonization of the different components at the scientific and organizational levels.

Last but not least of the organizational merits of the Network, is the intense use of Internet-based services to enhance the interactions and communications among the different teams.

Scientific output

The scientific output of the Network in its first two years of existence has been more than satisfactory. With 52 joint publications plus other 16 publications by Young Researchers of the Network and, finally, other 11 joint publications with other RTN Networks, there is no doubt that we are witnessing a vast production, but, what I consider even more important, is that such production is of relevant scientific level and conveniently spread over the large spectrum of

interests that the Network covers. Let me emphasize that the scientific output of the Network includes works on the most recent breakthroughs in applications of particle physics to cosmology (for instance, in brane cosmology) proving that the Network is at the most advanced edge of the progress in cosmoparticle physics.

Overall progress with the research

From what I said above, it should be clear that I consider the overall progress being made on the joint programme of research fully justifying the original selection of this Network. Indeed, the astroparticle research field rapidly developed first in the US, while in Europe, in spite of single interesting contributions, we had to wait more to have the start of systematic studies and schools in astroparticle physics. This Network, with its distinctive strong accent on the co-operation between the particle physics and cosmology communities, is a precious tool to further develop this interesting branch of research in Europe.

Appointment of young researchers

The Network has succeeded to deliver 150 person-months of postdocs until 30/09/02 on a total number of deliverable person-months of 336. Looking at the distribution of the appointed postdocs, one can notice some anomaly with a couple of nodes which delivered a very limited percentage of the total amount of deliverable person-months postdocs at their disposal. However, by the time the Mid-term review meeting took place, all the Teams were going to deliver all the person-months training specified in the Contract.

All the vacant positions for young researchers were adequately advertised. The result that typically over ten applications were received from qualified candidates for each post advertised shows that the Network represents a strong attraction for young researchers who intend to proceed along the exciting road of astroparticle physics.

The high quality of the young researchers appointed as postdocs by the Network is witnessed by their publications and by their presentations at international meetings. I had the chance to be at some of these meetings and I could see myself that the scientific maturity reached by some of the Network postdocs was certainly of excellent level.

Training of the young researchers

I have just said about the high scientific quality of the postdocs appointed by the Network. I think that, in addition to the intrinsic qualities of these young researchers, the Network has largely contributed to the promotion of such quality in their research. First of all, my impression is that the Network accurately avoided to "make use" of the young researcher skills for routine tasks or merely computational contributions, but rather tried to fully integrate them in the working teams operating in strict collaboration with senior researchers. Of equal relevance from the point of view of training was the effort of the Network to create opportunities for the postdocs to interact with Network researchers outside their own team. In particular the network meetings and schools represent a good opportunity for interactions of the young researchers with senior and junior members of other nodes and some collaborations found their origin during such gatherings. As emphasized in the Mid-term review report and in the reports of some postdocs at the Mid-term meeting, the Network strongly encourages young researchers to represent the Network at conferences and it gives priority to them for presenting their work at network meetings. Finally, my impression is that the nodes are taking particular care of the postdocs they hire within the frame of the Network. Indeed, given the large variety of interests from node to node, it often happens that even young researchers who obtained their PhDs at other nodes of the network (or at institutions which have close links with the network) have to enter new research fields when starting their PhD appointment. Hence, it becomes

crucial that the node receiving the new postdoc makes a special effort to integrate the newcomers into the research lines pursued in the node. In my view, the Network has been largely successful in this operation, as also the list of publications coming from single nodes manifests.

A crucial aspect of this Network which is particularly relevant also for its training tasks concerns its multidisciplinary nature. The Network aims at favouring the formation in Europe of a group of young researchers who succeed to operate on subjects requiring a deep background and expertise in particle physics and cosmology. This is a difficult and challenging task and, in my view, the Network has to make use of all its possible skills to strengthen its action to further improve this precious role it is playing in the European scientific community. Maybe even more care should be devoted to the organisation of schools which should try to fill the gap between an education which privileged the astrophysical and cosmological contents and another one centred on quantum field theory and particle physics. Another aspect related to this point concerns large nodes where several teams are present. Given that it occurs that the interests cultivated by the various teams may largely differ, it is important to further enhance the possibility of communication and interaction between the teams, with particular attention to the postdocs who operate in them.

In view of what I said, it should be clear that in my view the original selection of this Network finds one of its major justifications, after two years, on the remarkable overall progress being made with the training.

Final comments and recommendations

In my view, in its two first years of activity, the Network has shown that it is possible with the resources we have in Europe to give rise to a joint effort of high energy physicists and cosmologists who successfully tackle one of the most challenging research fields at the moment: the exploration of physics beyond the electroweak Standard Model using the interplay of such high energy physics with the physics of the early Universe. As I said, I think that the promotion of such an effort at the European level is certainly timely and needed, in particular in view of the enormous observational and theoretical progress which was registered in cosmology in these last few years and also, at the international level, of the large interest and investment in the field in US and Japan. The Network gave a positive answer to such demand in terms of selection of valid objectives (with a relevant flexibility to cope with rapid changes in the field), of high quality scientific output and of good training of young researchers.

To further enhance the success of these first two years, let me add a couple of recommendations:

- i) a truly astroparticle physics Network cannot be very homogeneous in its composition given the simultaneous presence of particle physicists and cosmologists; indeed, this is the case for the present Network and, hence, every effort should be made to promote the communication and interactions between different teams, in particular if they are of "particle" and "cosmo" nature. This applies also to large teams which should be encouraged to interact as much as possible with smaller and/or more isolated teams;
- ii) the intrinsic interdisciplinarity of the Network demands a thorough attention to the educational aspects in the training of the young researchers trying to achieve some basic common background in spite of their different curricula of studies; schools or meetings with dedicated pedagogical sessions for young postdocs (and, in fact, also for senior people) are generally welcome to improve the quality of Networks, but this is particularly true in this case given the very special nature of the astroparticle research field.